REMARKS

Applicants have cancelled claims 36-58 without prejudice expressly reserving the right to pursue the full scope of the subject matter of the cancelled claims in one or more subsequent application.

Applicants have added new claims 59-97. The newly added claims correspond to the previously cancelled claims, or find support in the application, as follows:

Claims 59-66 correspond to claims 36-43, respectively.

Claim 67 corresponds to claim 36.

Claims 68-69 correspond to claims 45 and 46.

Claim 70 is supported by paragraph [0025] of the application as published.

Claim 71 corresponds to claim 47.

Claims 72 and 73 are supported by paragraph [0082].

Claims 74-78 correspond to claims 48-52 respectively.

Claims 79 and 80 are supported by paragraphs [0092] and [0093] respectively.

Claim 81 is supported by paragraph [0086].

Claims 82 and 83 correspond to claims 53 and 54 respectively.

Claim 84 is supported by paragraph [0094].

Claim 85 is supported by claim 59.

Claims 86-88 is supported by Tables 1 and 4.

Claims 92-93 are supported claim 41 and paragraph [0031].

Claim 94 is supported by claim 41.

Claims 95 and 96 are supported by paragraph [0025].

Claims 97 corresponds to claim 52.

Previous claims 36 to 55 stand rejected under 35 U.S.C. 103(a) for purportedly being unpatentable over Sutton *et al.* (US 4,994,100), Naohiko *et al.* (*Japanese J. of Soil Science* (2001) 72:206-213), and Cookson *et al.* (Soil Biol. and Biochem. (2002) 34:1461-1465), in view of Smutek *et al.* (US 4,560,796). Applicants disagree and although Applicants have cancelled claims 36-55 without prejudice and have replaced them with claims 59-97, Applicants address this rejection as applied to the former claims and the now pending claims.

The Examiner considers that it would be obvious to arrive at a method for soil management in pasture systems, as claimed in former claims 36-55, based on the teachings of the cited references. The Examiner further considers that one of ordinary skill in the art would be motivated to make the combination, in order to "receive the expected benefit of a method for soil management in pasture farming systems comprising the use of a nitrification inhibitor, DCD, that is easy to handle and measure". However, Applicants submit that the methods of the present invention are not taught or suggested by the cited art and they provide wholly unexpected results.

The present invention relates to a soil treatment method for use in pasture farming systems, where a nitrification inhibitor is applied to substantially the whole area, including urine patch and non-urine patch areas, to reduce nitrate leaching, reduce nitrous oxide emissions, reduce potassium, calcium or magnesium leaching and increase pasture production. The present invention also relates to a method of improving pasture production in a grazed pasture by applying a nitrification inhibitor, the method including the step of applying the nitrification inhibitor in a solution and/or fine particle suspension form to treat substantially the whole of the grazed pasture area including the

urine and non-urine patch areas. The present invention also relates to a method of reducing nitrate leaching; reducing nitrous oxide emissions; reducing potassium, calcium or magnesium leaching, from a grazed pasture soil including animal urine and non-urine patches, and increasing pasture production. The method includes the step of applying a nitrification inhibitor in solution and/or fine particle suspension form and/or crystalline form over substantially the whole surface area of the grazed pasture. Such methods are not taught or suggested by the cited art alone or in combination.

In contrast to Applicants' invention, Naohiko *et al.* describe the effect of mixing a nitrification inhibitor with cow urine before application onto grassland. Naohiko *et al.* describe a reduction in nitrous oxide generation as a result of application of this mixture. This is a very different approach to the present invention and would require repeated applications of nitrification inhibitors every time a cow urinates. In contrast, the present invention involves treating the soil (rather than cow urine) with a nitrification inhibitor. Therefore, in practicing the methods of the present invention there is no need to apply nitrification inhibitor every time a cow urinates.

Cookson *et al.* describe the effect of DCD on (inter alia) nitrate-N production under field conditions and teaches that the application of DCD to pasture soil did not increase pasture yield under field conditions. Cookson *et al.* describe that DCD slows down nitrification rate in the soil as measured in the field. Their work does not demonstrate directly that the application of DCD decreases nitrate leaching, nor does it demonstrate reductions in nitrous oxide emissions and cation leaching. Furthermore, their work does not demonstrate the benefit of increased pasture production and thus the economic incentive for using nitrification inhibitors in grazed pastures. In fact, Cookson *et al.* teach away from treating the whole area of grazed pasture soil with a nitrification inhibitor by teaching that treatments of with DCD, did not increase pasture production. Currently the only economic driver for applying a nitrification

inhibitor is if it produces more pasture feed for grazing animals and because this was not achieved in the Cookson *et al.* study, their work would discourage the use of such an inhibitor.

Sutton *et al.* describe a particularly formulated fertilizer consisting of urea, dicyandiamide, ammonium thiosulfate, and optionally a phosphate compound. The focus of this document is this formulation mixture. The fertilizer is prepared by adding DCD and ammonium thiosulfate to molten urea. Sutton *et al.* states that this particular fertilizer delivers increased nitrogen uptake efficiency to plants. Their invention also relates to an improved urea based fertilizer which experiences decreased exposure to losses of nitrogen. At column 4, lines 34 to 41, Sutton *et al.* describe the use of the granular fertilizer on turf with a net result of a controlled growth rate and a thicker overall turf. Examples 3 to 16 provide comparisons of the fertilizer with other fertilizers for use on turf. Sutton et al. does not relate to the treatment of grazed pasture land to reduce e.g nitrate leaching, nitrous oxide emission and potassium calcium or magnesium leaching or to increasing production in a grazed pasture area. Thus Sutton et al. in combination with Cookson *et al.* would not motivate one of skill in the art to generate Applicants method as claimed and one of skill in the art would have no reason to expect that application of a nitrification inhibitor grazed pasture soil with in a solution form, a crystalline form, or a fine particle suspension form to cover substantially the whole of an area grazed pasture soil would increase pasture production. Naohiko who teaches the treatment of cow urine before its application onto grassland does not compensate for Sutton et al. and Cookson et al.'s deficiciencies.

In sum, Naohiko teaches the treatment of cow urine before its application onto grassland, Cookson *et al.* teaches away from the claimed invention by teaching that the application of DCD to pasture soil did not affect pasture production and Sutton teaches a particularly formulated fertilizer and its effects on plants when applied in the growing season. None of these documents teach

the claimed method and considered within the knowledge of the art at the time of this invention their combination fails to teach or suggest the method as currently claimed, wherein a nitrification inhibitor is applied to the entire pasture, including urine and non-urine patches, nor do they suggest the unexpected results obtained with the claimed method, i.e., reduced nitrate leaching; reduced nitrous oxide emissions; reduced potassium, calcium or magnesium leaching; and increased pasture production.

Even combining the particular form of dicyandiamide crystals disclosed in Smutek *et al.* with Naohiko, Cookson *et al.* and Sutton et al. does not compensate for the deficiencies of latter references because Smutek *et al.* only describe a process of producing a particular form of dicyandiamide crystal, which is a friable product having an increased density. There is no teaching that would lead the skilled person to the methods of the present invention.

In the currently claimed method, the nitrification inhibitor is not applied with the nitrogen source and neither is it applied every time the nitrogen source is applied. Therefore, an application of the inhibitor in the Autumn, and optionally an application in the Spring, as in accordance with the methods of the invention are all that is required to achieve the benefits of the invention. The fact that an application in the Autumn will have an on-going effect on the leaching and gas emissions through Spring when the next application is made is entirely unexpected.

The claims include the application of a nitrification inhibitor to substantially the whole area of a grazed pasture. This includes both urine and non-urine patch areas of the pasture, not just to the urine patch. It is applied to substantially all of the grazed pasture. In this way, leaching and gas emissions that occur as a result of later deposits of urine-N, in particular, are reduced. The leaching and emission effects of random nitrogen deposits are therefore diminished for an ongoing period (from a single application in Autumn until a single application in Spring). This provides the advantage of 'future-proofing'

the soil in order to reduce the risk of nitrate leaching and/or nitrous oxide emissions that can result from such random urine deposits. There is no teaching or suggestion in the cited documents of spreading a nitrification inhibitor over the whole of the pasture, separately from the nitrogen source, which provides this type of 'future-proofing'. The fact that an application in Autumn will have an ongoing effect on leaching and emissions through until Spring when the next application is made is entirely unexpected.

A further advantage of the methods of the present invention is a consistent increase in pasture production. The prior art does not teach or suggest this. It is quite unexpected that the use of nitrification inhibitors would have any effect on pasture production. Furthermore, it is unexpected that a single application of nitrification inhibitor in the Autumn or two applications (Autumn plus Spring) not only give pasture yield increases in the urine patch areas, but also in the non-urine patch areas. This result is not an "expected benefit", as suggested by the Examiner. In fact, prior to the present invention, it was a consistently held view of more than 20 years that such an increase in pasture production would not be provided by the application of a nitrification inhibitor (e.g. Turner and McGregor, 1978).

The present invention represents a major step in agricultural pasture management. A single broad-based application of nitrification inhibitor to grazed pasture results in leaching and gas emission reduction as well as pasture production promotion. The method of the present invention provides a solution to the well known problems resulting from random urine-N deposits and, in addition, offers increases in pasture production. These results are unexpected, based on the teachings of the prior art, and indeed are contrary to view that was held prior to the present invention.

Applicants therefore respectfully request that the rejection of the claims under 35 .U.S.C. 103(a) be withdrawn.

If there are any questions regarding this amendment or the application in general, a telephone call to the undersigned would be appreciated since this should expedite the prosecution of the application for all concerned.

If necessary to effect a timely response, this paper should be considered as a petition for an Extension of Time sufficient to effect a timely response, and please charge any deficiency in fees or credit any overpayments to Deposit Account No. 05-1323 (Docket #101547.55778US).

Respectfully submitted,

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